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(56) Documents Cited

GB 2284582 A

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US 5689241 A

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US 5786765 A

US 5596319 A

(58) Field of Search

UK CL (Edition T) G1A AAJL AMRP, G4N NHVSB,
G4Q QAF QCE

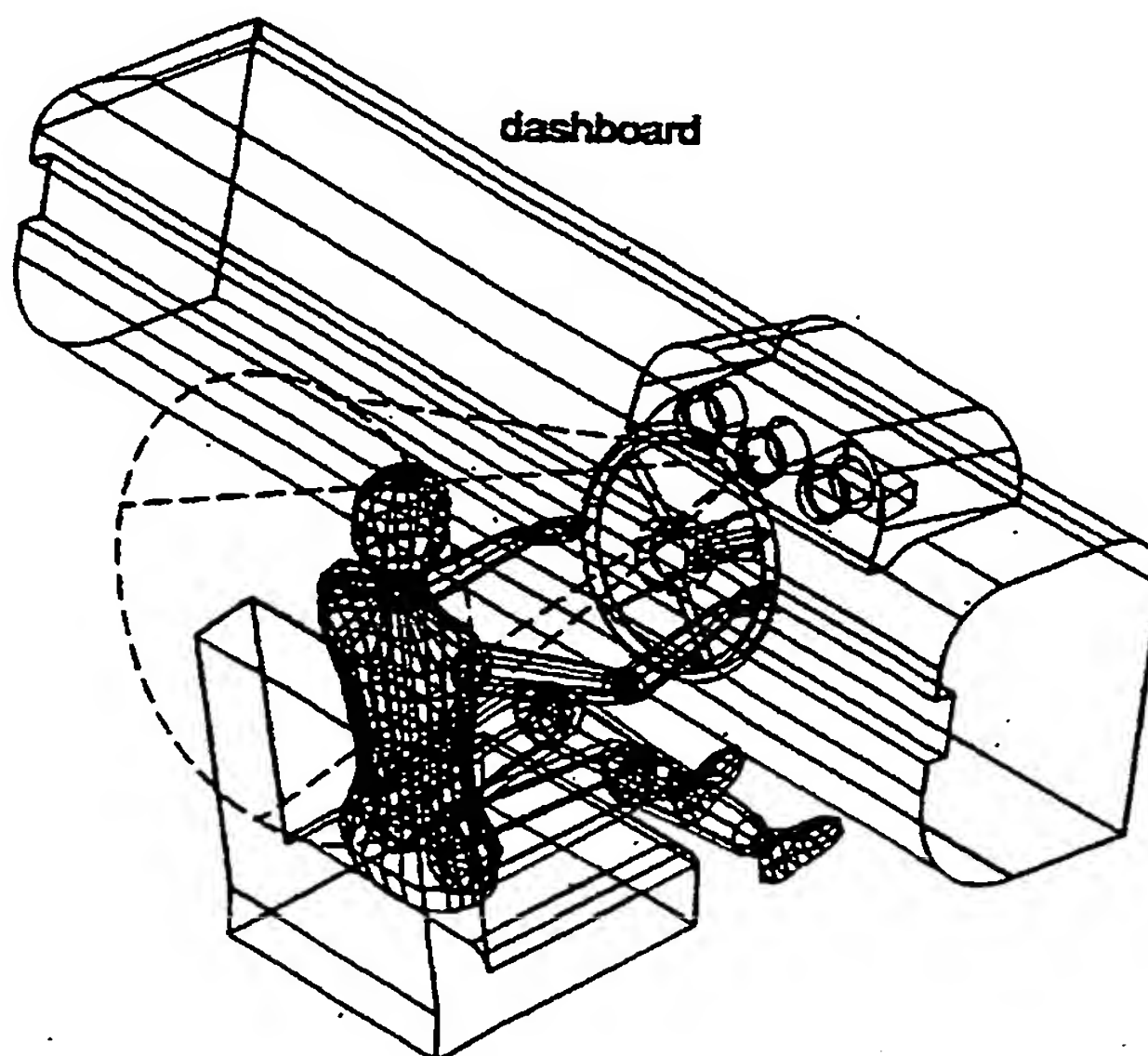
INT CL⁷ B60K 28/06, G06K 9/00, G08B 15/00 21/00

ONLINE : WPI, EPODOC, JAPIO

(54) Abstract Title

Driver drowsiness monitor and recognition system

(57) A system for a vehicle having a camera which is used to derive the facial characteristics of the vehicle operator. These characteristics are used to monitor the operator for signs of fatigue and provide a warning when fatigue is detected. The characteristics may also be used to identify the operator of the vehicle to prevent operation of the vehicle by an unauthorised person. The system may also incorporate data logging facilities which can record, transmit and receive data to and from remote locations.

**FIG 1****GB 2 371 396 A**

DRAWING 1 OF 2

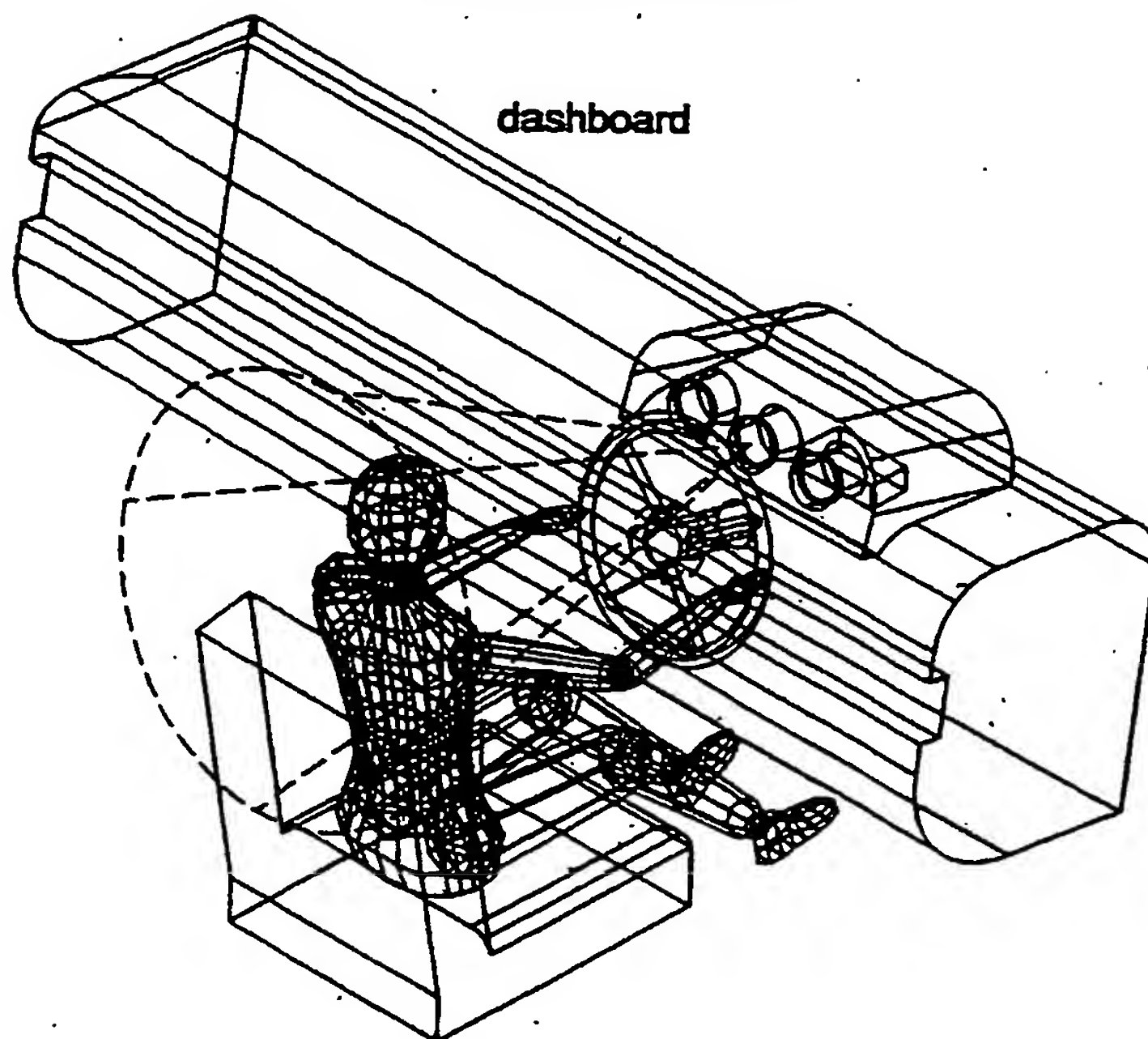


FIG 1

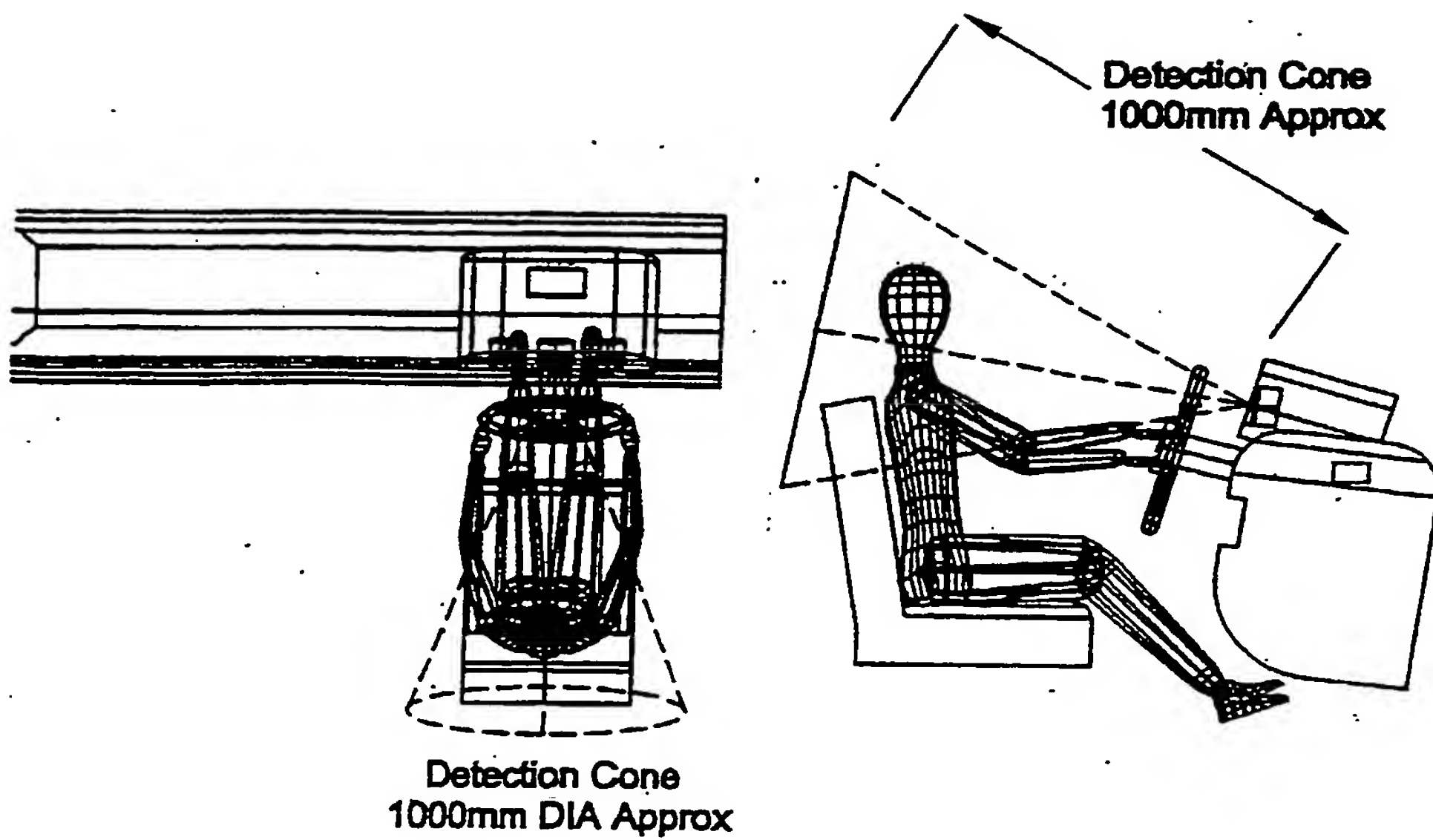


FIG 2

FIG 3

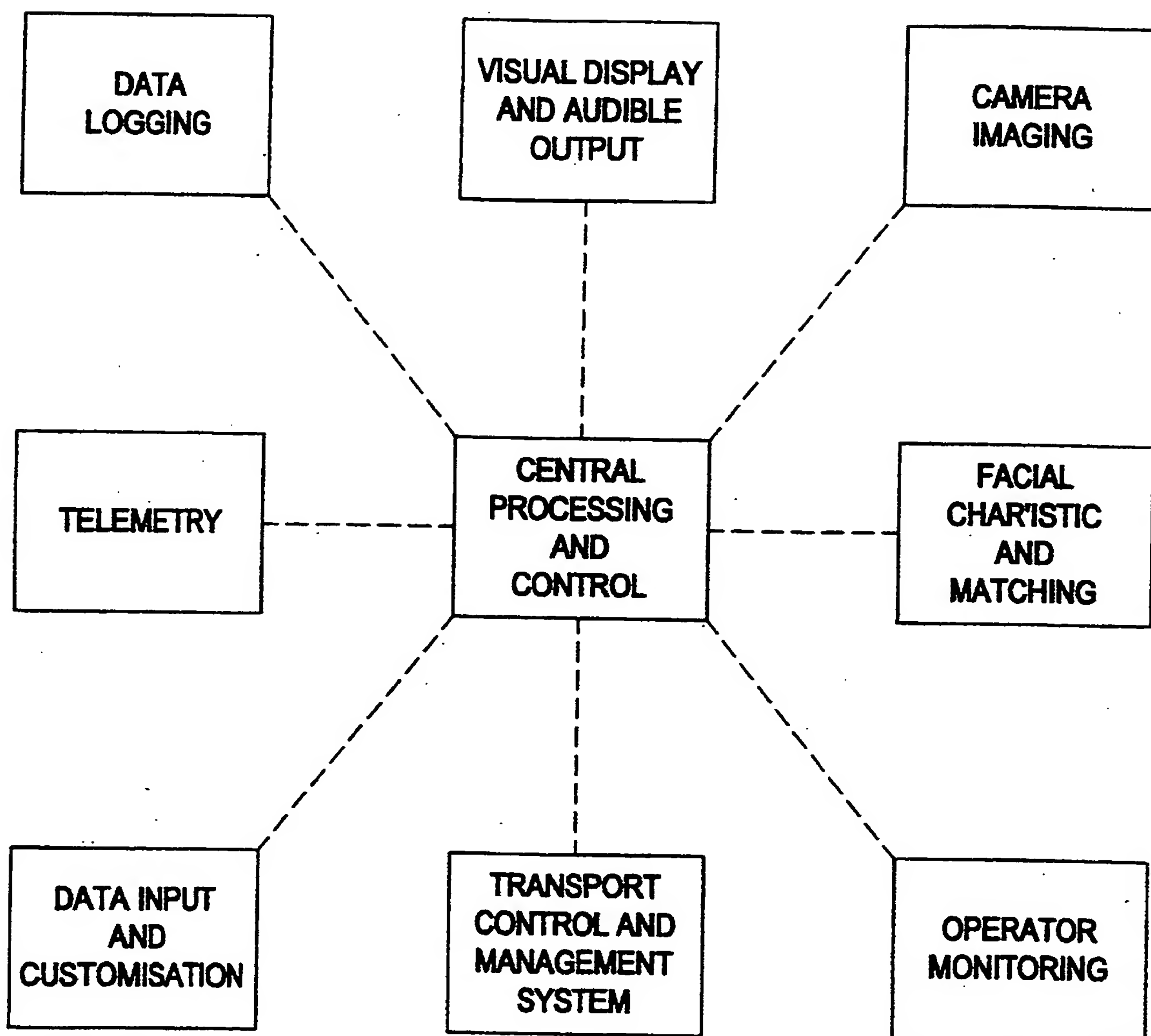


FIG 4

Transport Security and Safety System

Definition: 'Operator', for the purposes of this patent application, means the human driver, pilot, captain, or any person in a position of direct control of the transport.

This invention is concerned with a system that improves transport security, control and monitoring including the continuous monitoring of the human operator of a transport for behavioural indicators including fatigue.

Other devices for providing measures of transport security are well known and these, which include keys and electronic coding techniques, are known to be unreliable. Devices for monitoring human operator behaviour including detecting operator fatigue using the method described in this patent are not known to exist.

An object of this invention is to provide a new approach to improving transport security, control and human behavioural monitoring including the detection of human fatigue.

Accordingly, this invention provides a system that initially identifies the operator of a transport as being authorised to operate that particular transport. This is to be achieved by the use of one or more cameras, which are used to derive operator facial characteristics. These characteristics, and in particular the characteristics of the human iris, are used in a matching process to positively identify the operator before the system permits the transport engine or power source to be started. Once a journey is commenced the system continuously monitors various aspects of the transport, as is described more fully below, together with human operator behaviour and in particular the operator's eyes and eyelids for signs of fatigue. The system issues visual and audible warnings when fatigue is detected. The system also incorporates data logging facilities and these can record, transmit and receive data to and from remote locations, events as they occur. The System may also incorporate facilities for prescribed elements of remote control.

The system is to be made of a suite of enclosures, components and cables that interlink to form the system. The system can be surface mounted in existing transports or may instead be incorporated as part of a new transport build.

A preferred embodiment of the invention will now be described with reference to the accompanying drawing in which:

Figures 1-3 shows the views of an operator, which for the purposes of this drawing illustration, is a driver of a motor vehicle. The drawing shows the approximate dimensions of a detection cone created by camera(s) within which the operator's facial characteristics can be determined. The figures depict a system incorporated as part of a transport new build. A surface mounted system would be similar except that certain components would need to be separately mounted.

Transport Security and Safety System

Fig 4 is described as follows: -

Central Processing and Control: This central part of the system coordinates all sub-systems as described below: -

Camera Imaging: Sub-system; this part of the system determines an operator's head location and provides digital images containing sufficient facial detail to enable further image processing work to be carried out.

Facial Characteristics and Matching: Sub-system; this part of the system compares digital images with stored database information to identify the operator of the transport. The system deploys a face and iris matching algorithms that use distinctive human features for identification.

Operator Monitoring: Sub-system; this part of the system uses algorithms to continuously monitor human behavioural indicators including fatigue.

Transport Control and Management System: Sub-system; this part of the system is used to permit the engine or power source to be started following authorised operator identification. This part of the system also collects transport data such as movement and speed. The System may also incorporate facilities for prescribed elements of remote control.

Data Input and Customisation: Sub-system; this part of the system is used to facilitate data entry by the transport owner to initialise and customise system operation.

Telemetry: Sub-system; this part of the system is used to determine transport location and communicate information as required to and from one or more remote locations.

Data Logging: Sub-system; this part of the system is used to store data.

Visual Display and Audible Output: Sub-system; this part of the system is used convey messages to the operator of the transport.

Where appropriate the systems and sub-systems described above are to be housed within an enclosure made of a material that will be resistant to impact and fire damage.

CLAIMS

1. A transport security, control and monitoring system that provides a means of improving transport security, control and monitoring including the monitoring of the human operator¹ of a transport for behavioural indicators including fatigue.
2. A system as claimed in Claim 1 wherein one or more cameras are used to determine an operator's head location and derive digital images of sufficient facial detail to enable further image processing work to be carried out.
3. A system as claimed in Claim 1 wherein face and iris matching algorithms are used in conjunction with stored database information to identify the transport operator.
4. A system as claimed in Claim 1 that permits a transport engine or power source to be started only if the operator is authorised to control or drive that particular transport.
5. A system as claimed in Claim 1 that continuously monitors the operator's facial movements, eyes and eyelids for signs of fatigue.
6. A system as claimed in Claim 1 that stores data including the transport data such as movement and speed.
7. A system as claimed in Claim 1 that determines the transport location and communicates information, including that of Claim 6, to and from one or more remote locations.
8. A system as claimed in Claim 1 that is capable of receiving data from one or more remote locations and that can provide prescribed elements of remote control.
9. A system as claimed in Claim 1 that conveys visual and audible messages to the operator of a transport.
10. A system as claimed in Claim 1 of interlinking enclosures, components and cables that can be incorporated in the build of new transports or surface mounted in existing transports.
11. A system as claimed in Claim 10 that is made from enclosures, components and cables resistant to impact and fire damage.
12. A transport security and safety system substantially described in pages 1-4 herein and illustrated in Figures 1-4 of the accompanying drawings.

¹ for the purposes of this patent, 'Operator' means the human driver, pilot, captain or any person in a position of direct control of the transport.

² for the purposes of this patent, 'transport' means motorised vehicle, aeroplane, marine vessel, train or anything capable of transporting persons or things from one place to another.



INVESTOR IN PEOPLE

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Claims searched: 1-12

Examiner: Richard Kerslake
Date of search: 16 May 2002

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

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Int Cl (Ed.7): G08B 15/00, 21/00; B60K 28/06; G06K 9/00

Other: Online: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2284582 A (TOAD) Page 1 line 15 - Page 2 line 28	1,2,5,9-11
X Y	GB 2215040 A (RITCHIE) Page 2 line 21 - Page 3 line 32	X(1,2,5,9-11) Y(6-8)
XE	WO 02/08023 A2 (TRW INC.) Page 3 lines 5-20, Page 13 line 9 - Page 14 line 16	1-5 & 9-11
XE	WO 02/08022 A2 (TRW INC.) Page 3 lines 5-21, Page 13 line 1 - Page 14 line 8	1-5 & 9-11
X	WO 99/36893 A1 (HOLDING) Page 2 line 20 - Page 6 line 5, Page 32 line 10 - Page 33 line 6	1,2,5,9-11
X	US 5786765 A (KUMAKURA et al.) Column 3 line 33 - Column 4 line 62	1,2,5,9-11
X	US 5689241 A (CLARKE, Sr. et al.) Column 3 line 53 - Column 6 line 10	1,2,5,9-11
Y	US 5596319 A (SPRY) Fig 1 & Column 2 line 37 - Column 3 line 56	6-8

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
& Member of the same patent family

A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
E Patent document published on or after, but with priority date earlier than, the filing date of this application.